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The oxygen ratio is $RO : R_2O_3 : SiO_2$—

$$1 : 1.28 : 2.19$$

and the atomistic formula is—

$$\left.\begin{array}{l} \overset{IV}{Si}_{17} \\ \overset{VI}{Al}_5\overset{VI}{Fe} \\ \overset{II}{Mn}_{11}\overset{II}{Fe}_4 \end{array}\right\} O_{70}$$

It will be noticed that iron is contained in this garnet, both in the ferrous and in the ferric state, while in the analyses on record the iron is given as being all in the ferrous state. When those analyses were made, the method of decomposing minerals in strong sealed tubes at a high pressure was not known, and the mineral cannot be decomposed at the ordinary atmospheric pressure, as stated above. In heating the powder for thirty-six hours with acid containing 25 per cent. of sulphuric hydrate at 160° C., I succeeded in decomposing all but 7 per cent. The ferrous oxide obtained from the solution was then calculated pro rata for the undecomposed part, and the above result obtained.

To suppose that the presence of ferric iron is due to incipient alteration would not be justified, since no water was obtained by ignition, and the pellucidy of the mineral does not appear impaired. To explain the result of analysis the presence either of ferric oxide or manganic oxide must be admitted, which alternation would neither affect the oxygen ratios, nor the atomic composition.

I am indebted to Mr. Clarence Bement of this city for the material used in this investigation, and I hereby express my thanks for his kindness.

The thanks of the Academy were returned to Dr. James S. Gilliams for a portrait of the late Jacob Gilliams, one of the founders of the Academy, painted by Rothermell.

APRIL 11.

The Rev. E. R. BEADLE in the chair.

Thirty-four members present.

The following papers were presented for publication: "The Genus Pomoxys, Raf." By D. S. Jordan and H. E. Copeland. "Chemical Notes." By Geo. Hay.

Remarks on Arcella, etc.—Prof. LEIDY remarked that the Rhizopods are so exceedingly polymorphous, that, to say the least of them, their specific and generic limits appear less well defined than in higher animals. In speaking of the Difflugian Rhizopods, Dr. Wallich expresses the opinion that the whole are referable to a single specific type, and as regards the Foraminifera, Prof. Carpenter observes "whether it will ever be practicable to arrange the multitudinous forms of this group in natural assemblages, whose boundaries shall be capable of strict limitation, is to us by no means certain."

It would seem that the existing Rhizopods, in respect to classification, may be viewed as an epitome of all organic forms in all times, for if all these could be known it would be found that there were no absolute limits defining species or any other of the usual divisions in classification. The study of the Rhizopods is facilitated by determining the more general and striking forms, and viewing the others as transitional or related forms, and we can better communicate the results of our study if the more characteristic forms are named as species or varieties.

In his studies of the fresh-water Rhizopods, of various localities in this country, he had recognized most of the well-marked forms which have been described by European naturalists as pertaining to other parts of the world. Besides these he had detected a number of new forms, which perhaps in future will be found not to be peculiar to this country. As an example, in the published Proceedings of this Academy for 1874, page 226, will be found the description of a species, *Euglypha brunnea*, from New Jersey. Since then the same has been described in the Quarterly Journal, of the Microscopical Society of London for 1876, page 107, by Mr. Archer, under the name of *Euglypha tincta*. Mr. Archer's description applies so closely to the specimens observed by Prof. Leidy in every detail, that he thought he was not mistaken.

Among the usually recognized generic forms, Arcella had occupied his attention. In this genus the animal is provided with a membraneous test, composed of exceedingly minute hexagonal elements, usually of some shade of brown, but colorless in the young condition. The shape of the test is usually that of a greater or lesser portion of a sphere with a circular plane below more or less inverted towards a central circular mouth. The soft part of the animal rarely fills the test, but adheres to its inner surface by threads of the ectosarc. Pseudopods digitiform.

The species or varieties observed are as follows:—

ARCELLA VULGARIS, Ehrenberg.
Difflugia arcella, Wallich; *Arcella hemispherica*, Perty.

This is perhaps the most common form. Test approximating a hemisphere with the base rounded and often more or less projecting. The dome is even or mammillated, or is impressed at the sides with concave shallow pits or angular facets. The inferior surface is more or less funnel-like, and the mouth elevated and circular. Color of the tests, from colorless in the young through all shades of raw sienna to burnt sienna brown. Sarcode colorless. Breadth of test from .06 mm. to .132 mm., height .036 to .08; mouth .02 to .048.

? ARCELLA DISCOIDES, Ehr.

A discoid variety of the former, and nearly as abundant, has the test of the same form but three or four times the breadth of the height, and with the dome almost constantly convex and even. Mouth large. Measurement of a small colorless one: breadth .112 mm., height .028; breadth of mouth .04. Measurement of a large burnt sienna brown test: breadth .132, height .028; breadth of mouth .048.

Certain discoid specimens from Florida approach those described by Ehrenberg under the name of *A. peristicta*, from South America. They are sub-circular, oval, or irregularly oval, often bent or curved in the shorter diameter; in section concavo-convex, with rounded ends. Mouth large, circular or oval, moderately elevated. Dome convex and even. Test in the vicinity of the mouth with a circle of minute tubercles or pores? Color of test varying as in other Arcellæ. Sarcode colorless. A test measures .14 mm. broad, .128 wide, and .068 high; with the circular mouth .052 diameter. A second is .16 broad, .144 wide, .064 high, and with the mouth .064 broad and .08 wide. A third is .184 broad, .172 wide, and with the mouth .06.

ARCELLA MITRATA.

A variety modified in form from the *A. vulgaris* in the opposite direction of *A. discoides*. Test mostly higher than the breadth at base, inflated above, balloon form, pyriform, mitriform; dome convex, even, or polyhedral with impressed angular faces. Mouth elevated as usual, but with its margin usually crenate and everted. Sarcode colorless, attached by many diverging threads of ectosarc to the inside of the test. Color of the test, from colorless through all shades of raw and burnt sienna to bistre brown. Abundant, and very polymorphous, at Absecom cedar swamps, New Jersey. = *Arcella costata*, Ehr. ?

a. Balloon-shaped sub-variety, forming about four-fifths of a sphere and with an even dome. Height to .14 mm., breadth at middle equal to the height, at base .088.

b. Pyriform, polyhedral sub-variety. Height .096, breadth above middle .076, at base .048.

c. Mitriform, polyhedral sub-variety. Smallest: height .08, breadth above middle .084, at base .068. Largest: height .168, breadth above middle .2, at base equal to the height.

ARCELLA DENTATA, Ehr.

A. stellata, Ehr.; *A. stellaris*, *A. Okeni*, and *A. angulosa*, Perty.

Test circular, discoid, usually not so high in relation with the breadth as in *A. vulgaris*. The border is everted, acute and divided into usually from eight to a dozen points; the border and points may also curve more or less upward, and the latter may extend as high as the summit of the test. Dome convex and even or flattened at the summit, or with carinate ridges diverging from the latter to the points of the border.

Breadth from .132 to .184 mm., height .04 to .048.

ARCELLA ARTOCREA.

Test from three to four times the breadth of the height with the margin circular and more or less elevated above the base. Dome convex and usually mammillated. Mouth elevated, central, circular and entire. Color of test, various shades of raw sienna brown; and structure as in other Arcellæ. Sarcode attached by many threads of ectosarc to the inside of the test. Entosarc loaded with chlorophyl balls which appear to be an element of structure.

This singular pie-shaped Arcella with a bright-green sarcode is frequent in a pond at Absecom, New Jersey. Breadth of the test at the rim .16 to .176 mm., at the base .124 to .136; height .04 to .052.

CENTROPYXIS, Stein.

Arcella aculeata and *Difflugia aculeata*, Ehrenberg; *Echinopyxis aculeata*, Claparede and Lachman.

Centropyxis is a nearly allied generic form to Arcella, and is so polymorphous that I have been puzzled to define varieties. The test or basis of the test is membranous, and appears not to exhibit the hexagonal structural elements of that of Arcella. The shape is a modification of that of the latter; the mouth and the summit of the dome being eccentric in opposite directions. The dome varies in degree of prominence and is always convex. The mouth varies in proportionate size, and is more frequently sinuous at the border than completely circular. The test presents all the variations of color presented by *Arcella vulgaris*. It is frequently provided with from two to five or more hollow, conical spines diverging from the wider border or that most distant from the mouth. Sometimes the test is clean or devoid of all adherent matters and appears homogeneous, mostly, however, it is more or less covered with mineral particles. Sometimes it is as completely covered with quartzose particles as an ordinary Difflugia, and frequently it is loaded with larger stones along the deeper border. In some specimens the test appears to be wholly composed of a single species of diatome shells.

I have observed a peculiar point of structure in most tests of *Centropyxis* which appears heretofore to have escaped notice. From the sinuous border of the mouth a number of processes extend upward to the dome. These are expanded at the end, and look as if intended to support the roof of the test, though I have not been able to satisfy myself that they actually reach it. Nor have I been able to ascertain whether the number of processes is constant, but they have appeared to me to vary in number from four to seven. They are not visible looking directly into the mouth of the test, but a glimpse of one or two may be detected when the mouth is aslant as the test is made to turn towards one side. From the usual discoid form of the test it is not easy to retain it in position on edge to conveniently examine the processes, and when the test is observed with adherent sand they cannot be seen at all.

Large spineless tests of Centropyxis, from ditches below the city, measure .26 mm. broad, .22 wide, and .08 high; with the mouth .1 diameter. Large spinous specimens, from the same locality, measure .22 broad by .208 wide, with the spines .48 long and the mouth .084.

A Difflugian of the sub-generic character I have indicated under the name of *Nebela* appears related with *Centropyxis*. Briefly described, it may be distinguished as follows:—

NEBELA CAUDATA.

Test compressed ovoid, laterally pyriform; mouth terminal, oval, entire; fundus obtuse and bordered with from four to five hollow, linear obtuse appendages. Structure of test apparently chitinous and indistinctly areolated. Sarcode colorless. Length $\frac{1}{12}$ mm., breadth $\frac{1}{16}$ mm., thickness $\frac{1}{42}$ mm. Living in sphagnum of a cedar swamp, at Absecom, New Jersey.

On the Nature of Root Fibres.—Mr. THOMAS MEEHAN remarked that two excellent papers had recently appeared on the eccentric growth of the annual layers of wood in some plants—one in the Proceedings of the Poughkeepsie Natural History Society, and the other in the American Naturalist. Reading these, it occurred to him that some observations of his on the nature of fibrous roots of plants were not generally known, and might interest the Academy.

In regard to the eccentricity of the wood, it was long known to observers that the pith of trees was often not in the centre, but varied considerably in its approaches to the circumference. In one case noted in the paper in the Naturalist, the pith of the poison vine was very near the outer edge of the wood, and somewhat elevated, forming a little ridge all along the bark. Various theories had been offered to account for this extra thickening on one side, but none of them, Mr. Meehan thought, accorded with all the known facts, and he believed the true explanation still awaited some fortunate discoverer. The author of the paper in the Poughkeepsie Proceedings had followed the wood chopper, and found that in perfectly erect trees, the pith was exactly in the centre, but in trees that leaned a little, as many would from being drawn towards the lightest places in infancy, the extra thickening was always on the under side. But in the paper in the Naturalist, the observer showed that in the poison vine, though growing to a perfectly upright tree, there was still this remarkable eccentricity, and further, that the degree of this eccentricity varied in the same stem at different places, although all in the same ascending line. The sloping theory, though supported by a remarkable uniformity of figures, could not be correct.

But his remarks had relation chiefly to a suggestion in the *Nat-*